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- **"IMPROVED HOT MELT ADHESIVE APPLICATOR" RESEARCH DISCLOSURE, no. 386, 1 June 1996, page 383 XP000596180**

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to a system for dispensing fluids onto a substrate, and more particularly to a system having a manifold coupled to an array of adhesive dispensing nozzles for precisely dispensing hot melt adhesives supplied from a reservoir to the manifold by a metering gear pump.

[0002] The precise dispensing of hot melt adhesives and other fluids onto substrates is required in many applications. The manufacture of a variety of bodily fluid absorbing hygienic articles including disposable diapers and incontinence pads, sanitary napkins, patient underlays, and surgical dressings, for example, often requires bonding one or more layers of material, or substrates. These layers of material include, more specifically, a fluid impermeable, highly flexible thin film such as polypropylene or polyethylene onto which is adhered a highly absorbent pad often formed of a cellulose or plastic material covered by a non-woven fleece-like material. The fluid impermeable thin film, however, is extremely temperature sensitive, and hot melt adhesives have a tendency to deform the film and in some cases melt through the film. Materials bonded in other applications are similarly temperature sensitive.

[0003] It is known to dispense hot melt adhesive onto a substrate from nozzles that form thin fibers or stands of adhesive, which are nearly invisible to the naked eye and incapable of melting or distorting the substrate. In many applications, a plurality of adhesive dispensing nozzles are arranged generally in an elongated array directed toward the substrate, which is usually moved transversely relative to the nozzles. The hot melt adhesive is very often supplied to the nozzles from a reservoir by a gear pump including several fluid outlets, which simultaneously supplies precisely metered amounts of adhesive to several corresponding fluid dispensing nozzles. U.S. Patent No. 4,983,109 to Miller et al., for example, discusses several gear pumps interconnected by a common manifold assembly, including a pump manifold and a distribution manifold, to a plurality of nozzles wherein each gear pump simultaneously supplies precise amounts of adhesive to several corresponding nozzles. Each nozzle is specially configured for coupling with a corresponding adhesive supply conduit alone or in combination with a corresponding air supply conduit. A blocking plate configuration permits blocking alternatively the nozzle to prevent adhesive dispensing wherein the blocking plate recirculates adhesive back to the adhesive reservoir or back to the gear pump.

[0004] The inventors of the present invention recognize that controlling the temperature of compressed air combined with the hot adhesive in the nozzle is an effective means for controlling the adhesive dispensed by the nozzle. U.S. Patent No. 4,983,109 to Miller et al., however, is not capable of independently controlling air temperature since compressed air is supplied through the common manifold assembly, which is maintained at a temperature required for adequately supplying and properly dispensing adhesive. The inventors of the present invention also recognize that it is desirable to recirculate adhesive as a means for dynamic pressure regulation, which may be required in the event adhesive flow through the one or more nozzles becomes obstructed, which occasionally occurs over Prior art hot melt adhesive applicators generally regulate pressure by limiting current to the motor that drives the gear pump, or by a clutch assembly that slips to limit load on the motor resulting from excessive fluid pressure. In U.S. Patent No. 4,983,109 to Miller et al., adhesive is recirculated only when the nozzle is replaced by the specially configured blocking plate, which includes an internal passage interconnecting the adhesive supply conduit and the recirculation conduit. The blocking plate is however not intended to dispense adhesive or to regulate pressure in the event that an operational nozzle becomes obstructed.

[0005] EP-A-0346928 discloses a system for recirculating fluid in the event of a blockage wherein an O-ring in a dispensing nozzle assembly is deformable above a threshold pressure to open a passage to a recirculation conduit.

[0006] In view of the discussion above, there exists a demonstrated need for an advancement in the art of fluid dispensing systems.

[0007] According to the present invention a system usable for dispensing fluids including hot melt adhesives, supplied from a reservoir, onto a substrate, comprises:

a plurality of fluid dispensing nozzles;
a fluid metering device having a plurality of metered fluid outlets for supplying fluid from the reservoir;
a plurality of fluid supply conduits, each of which is interconnected between a metered fluid outlet of the fluid metering device and a corresponding fluid dispensing nozzle;
a plurality of fluid recirculation conduits, each of which is interconnected between a corresponding fluid supply conduit and one of the reservoir and fluid metering device; and
a plurality of one-way valves, each of which is disposed in a corresponding recirculation conduit, wherein each one-way valve independently recirculates fluid from its corresponding fluid supply conduit to one of the reservoir and fluid metering device when pressure in the corresponding fluid supply conduit exceeds a first threshold pressure.

[0008] Particular embodiments in accordance with the present invention will now be described with reference to the accompanying drawings; in which:

Figure 1 is a fluid flow schematic for a fluid dispens-

ing system according to an exemplary embodiment of the invention;

Figure 2 is a fluid flow schematic for a fluid dispensing system according to a first alternative embodiment of the invention;

Figure 3 is a fluid flow schematic for a fluid dispensing system according to a second alternative embodiment of the invention

Figure 4 is a fluid flow schematic for a fluid dispensing system according to a third alternative embodiment of the invention;

Figure 5 is a partial sectional view, taken along lines I - I in Figure 6, of a fluid dispensing system according to an exemplary embodiment of the invention;

Figure 6 is a partial top view of a hot melt adhesive dispensing system of the type shown in Figure 5 configured according to an exemplary embodiment of the invention;

FIG. 7a is a partial sectional view of a recirculation manifold according to an exemplary embodiment of the invention.

FIG. 7b is a partial sectional view of a recirculation manifold according to an alternative embodiment of the invention.

FIG. 8 is a partial sectional view of a pressure relief valve according to an exemplary embodiment of the invention.

FIG. 9a is a partial top view of a hot melt adhesive dispensing system of the type shown in FIG. 5 configured according to another embodiment of the invention.

FIG. 9b is a partial side view taken along lines II - II of the FIG. 9a.

DETAILED DESCRIPTION OF THE INVENTION

[0009] The present invention is suitable generally for dispensing fluids onto a substrate in a variety of applications, including applications where precise dispensing of fluid onto the substrate is required, and the invention is suitable particularly for precisely dispensing hot melt adhesives of the type used for bonding layered materials in the manufacture of hygienic articles.

[0010] According to the invention as illustrated in the exemplary fluid flow schematics of FIGS. 1 through 4, the fluid dispensing system 10 comprises generally a plurality of nozzles 20 interconnectable to a fluid reservoir, or tank, by a plurality of fluid supply conduits 30 and one or more fluid metering devices, or pumps, which independently supply fluid from the tank to each of the plurality of nozzles 20 through a corresponding fluid supply conduit 30. In another configuration, the system 10 includes a plurality of recirculation conduits 40 each interconnectable between a corresponding fluid supply conduit 30 and the tank by a plurality of one-way valves each disposed along a corresponding recirculation conduit 40. The one-way valves conditionally recirculate fluid from the corresponding fluid supply conduit 30 toward the tank, wherein fluid is recirculatable either back to the tank or back to the pump. The one-way valves are generally configured to recirculate fluid when pressure in the fluid supply conduit 30 exceeds a predetermined fluid pressure threshold. The one-way valves, moreover, independently regulate pressure between the pump or pumps and the corresponding nozzles 20 without affecting the pressure in the remaining nozzles.

[0011] In the exemplary fluid flow schematics of FIGS. 1, 2 and 4, the one-way valve is a normally closed check valve 50. The system 10 also includes at least one normally closed one-way pressure relief valve 60 disposed between the plurality of one-way check valves 50 and the tank. The check valves 50 are independently operated one-way valves, and are opened to recirculate fluid toward the tank when pressure in the corresponding fluid supply conduit 30 exceeds a first threshold pressure. The pressure relief valve 60 is opened to recirculate fluid toward the tank when the pressure between the check valves 50 and the pressure relief valve 60 exceeds a second threshold pressure, which is greater than the first threshold pressure. The check valves 50 independently regulate pressure between the pump or pumps and the corresponding nozzles 20 without affecting the pressure in the remaining nozzles. In one application, the first threshold pressure of the check valves 50 is several psi greater than the desired fluid pressure in the fluid supply conduit 30, and the second threshold pressure df the pressure relief valve 60 is between approximately 2 and 3 times the desired fluid pressure in the fluid supply conduit 30. In the exemplary fluid flow schematics FIGS. 1, 2 and 4, a manually operated pressure discharge valve, not shown, may also be disposed between the plurality of check valves 50 and the pressure relief valve 60 for relieving fluid pressures below the second pressure threshold, which is useful for resetting the system. In another configuration, a plurality of air supply conduits 70 each are interconnectable between an air supply not shown and a corresponding nozzle 20 wherein the air supply conduits 70 supply compressed air to the nozzle usable for modifying a fluid pattern dispensed therefrom as further discussed below.

[0012] The exemplary fluid flow schematic of FIG. 4 includes a normally closed diverter valve 80 disposed between the plurality of one-way check valves 50 and the tank in parallel to the normally closed pressure relief valve 60. The diverter valve 80 relieves fluid pressure between the plurality of check valves 50 and the pressure relief valve 60 to reduce fluid pressure in the fluid supply conduits 30 when the pump is energized and the plurality of nozzles 20 are closed. The diverter valve 80 reduces the tendency for fluid to surge through the nozzles 20 when the nozzles are first opened. The diverter valve 80 is a particularly desirable feature for applications where the nozzles 20 are opened and closed intermittently. In operation, the normally closed diverter valve 80 is opened when the nozzles 20 are closed, and the diverter valve is closed when the nozzles are

opened. The diverter valve 80 also eliminates any requirement for the manual pressure discharge valve discussed above.

[0013] In the exemplary fluid flow schematic of FIG. 3, the plurality of one-way valves are a plurality of normally closed pressure relief valves 60, which are opened to recirculate fluid toward the tank when pressure in the corresponding fluid supply conduit 30 exceeds a threshold fluid pressure. The pressure relief valves 60 independently regulate pressure between the pump or pumps and the corresponding nozzles 20 without affecting the pressure in the remaining nozzles. In one embodiment, the threshold pressure is between approximately 2 and 3 times a desired fluid pressure in the fluid supply conduit 30 as discussed above. In an alternative configuration, a plurality of air supply conduits 70 each are interconnectable between an air supply not shown and corresponding nozzles 20 wherein the air supply conduits 70 supply compressed air to the nozzles for modifying a fluid pattern dispensed therefrom as further discussed below.

[0014] The exemplary fluid flow schematics of FIGS. 1 and 4 include a pressure monitoring gauge 90 and pressure monitoring port 92 connectable between the plurality of check valves 50 and the pressure relief valve 60 for monitoring an average fluid pressure therebetween, which results from pressure increases in any one or more of the plurality of fluid supply conduits 30. According to the alternative fluid flow schematics of FIGS. 2 and 3, a plurality of pressure monitoring gauges 90 and ports 92 are each connectable with a corresponding fluid supply conduit 30 for monitoring individually fluid pressure in a corresponding fluid supply conduit 30 between a corresponding nozzle 20 and pump.

[0015] According to another embodiment, the pressure monitoring gauges 90 are either replaced by or coupled to a pressure transducer connectable to an audio or visual alarm for indicating that one or more fluid supply conduits 30 is recirculating fluid, which often indicative of an obstructed nozzle 20. In the configurations of FIGS. 1 and 4, a single transducer and alarm coupled to the pressure port 92 indicates generally that one or more fluid supply conduits 30 are recirculating fluid, but alarm does not specifically identify the fluid supply conduit 30 recirculating fluid. In the configurations of FIGS. 2 and 3, each fluid supply conduit 30 and nozzle 20 includes a corresponding transducer and alarm for identifying the specific fluid supply conduit or conduits 30 that are recirculating fluid.

[0016] In some applications it is desirable to intentionally block one or more fluid supply conduits 30 and recirculate fluid from the blocked fluid supply conduits 30 toward the reservoir without sounding an alarm or otherwise indicating that fluid is recirculating from the blocked fluid supply conduits 30. More specifically, one or more nozzles 20 may be intentionally turned off or replaced with a blocking plate that obstructs fluid flow from a fluid supply conduit 30. Under these circumstances fluid from the blocked fluid supply conduits 30 is generally recirculated to either the fluid pump or the fluid reservoir. Recirculating fluid through the recirculation conduit 40, however, precludes use of an alarm for indicating unintentional fluid recirculation, which may occur as a result of an obstructed nozzle. According to an alternative embodiment, recirculation conduit 42, coupled to either one or more closed nozzles 20 or fluid supply conduit blocking plates, recirculates fluid from the corresponding fluid supply conduits 30 toward the reservoir.

[0017] In the exemplary embodiment of FIGS. 5 and 6, the system 10 includes a main manifold 100 having a plurality of fluid supply conduits 30 coupled to a fluid metering device 300, which independently supplies fluid from a fluid reservoir, or tank, wherein the combination forms a metering gear-driven head. The main manifold 100 includes a first end portion 102 with a plurality of fluid outlet ports 32 each for coupling a corresponding fluid supply conduit 30 to a corresponding fluid dispensing nozzle 20. In an alternative embodiment, the main manifold 100 includes a second end portion 104 with a plurality of fluid outlet ports 32 for coupling a corresponding fluid supply conduit 30 to a corresponding fluid dispensing nozzle 20, wherein the fluid metering device supplies fluid to either or both end portions 102 and 104 of the main manifold 100.

[0018] In one embodiment, the fluid metering device 300 is a metering gear pump having a fluid inlet 320 coupled to the tank and a plurality of independent fluid outlets 330 each coupled to a fluid supply conduit 30 for providing precisely metered amounts of fluid to a corresponding nozzle 20. According to this embodiment, a single fluid metering device 300 independently and simultaneously supplies fluid to several fluid supply conduits 30 and nozzles 20. A pump suitable for this application is Model No. HSJ-62260-7000-0, having a fluid inlet port and eight fluid outlet ports, available from Parker Hannifin Corporation, Zenith Pumps Division, Sanford, North Carolina.

[0019] The main manifold 100 alternatively includes a well 110 for receiving the fluid metering device 300. An adapter plate 120 with a plurality of conduits 122 may be alternatively disposed between the fluid metering device 300 and the main manifold 100 for appropriately routing and coupling the fluid outlet ports 320 of the fluid metering device 300 with the fluid supply conduits 30. A sealing member may be disposed between the adapter plate 120 and the main manifold 100. A pump supply conduit 130 is disposed in the main manifold 100 for supplying fluid from the fluid reservoir, or tank, to the fluid metering device 300. In one embodiment, fluid is supplied from the tank to the pump fluid supply conduit 130 through a fluid filter 140 mounted in the main manifold 100. The fluid filter 140 includes a fluid inlet port 142 for coupling with the tank. A heating member disposed in the main manifold 100 heats the fluid metering device 300 and the main manifold 100 thereby providing

a relatively efficient means for heating the fluid, which eliminates the requirement of a separate heating element and insulation for the fluid metering device 300. In the embodiment of FIG. 6, the heating member includes a plurality of heater cores 150 disposed in a corresponding recess in the main manifold 100. In one embodiment, one or more temperature sensors are disposed in the main manifold 100 for providing temperature data to a heating member temperature controller.

[0020] In an alternative embodiment, a second fluid supply conduit 160 having an inlet port 162 on an upper side of the main manifold 100 extends between a first port 164 on a first side 106 of the main manifold 100 and a second port 166 on a second side 108 of the main manifold. The supply conduit 160 is coupled to the pump supply conduit 130, and the inlet port 162 is coupled to the tank for supplying fluid to the fluid metering device 300. The ports 164 and 166 are coupleable to corresponding ports on one or more other main manifolds, substantially identical to the main manifold 100, mountable adjacently on the first side 106 and the second side 108 of the main manifold 100 to form an array of main manifolds. In FIG. 6, a second side 108' of a second main manifold 100', shown in part, is mounted adjacently to the first side 106 of the main manifold 100 so that the second fluid conduit 160' of the second main manifold 100' is coupled to the second fluid conduit 160 of the main manifold 100. According to this arrangement, fluid is supplied to both main manifolds by coupling the fluid reservoir, or tank, to the fluid inlet 162 of the main manifold 100. Any of unused ports 162, 164 and 166 of the conduit 160 in the array of main manifolds may be plugged. In the exemplary embodiment, all but one of the fluid inlet ports 162, and the first port 164 and second port 166 on the outermost sides of array of main manifolds are plugged. The fluid supplied from the second fluid conduit 160 may be filtered by filter 140 in each main manifold before flowing to the inlet port 320 of the fluid metering device 300.

[0021] In the exemplary embodiment, each of the plurality of fluid dispensing nozzles 20 is part of a nozzle module 200 that is actuatable pneumatically to open and close the nozzle 20 on command. The nozzle modules 200 also have the capability to combine fluid from the fluid supply conduit 30 with compressed air for precisely controlling an amount and pattern of fluid dispensed from the nozzle 20. The nozzle module 200 includes a fluid interface 210 with a fluid inlet port 232 for coupling with a fluid supply conduit 30, and air inlet ports 214 and 216 for actuating the nozzle module 200. The nozzle module also includes an air interface 220 with an air port 222 for providing compressed air to the nozzle 20. A nozzle module particularly suitable for this purpose is the MR-1300™ Nozzle Module, available from ITW Dynatec, Hendersonville, Tennessee.

[0022] In the exemplary embodiment, the fluid interface 210 of the nozzle module 200 is mountable on either the first end portion 102 or the second end portion 104 of the main manifold 100 for coupling the fluid inlet port 232 with a corresponding fluid supply conduit 30. The main manifold 100 includes air supply conduits 170 corresponding to each fluid supply conduit 30 and coupleable to the air inlet ports 214 and 216 of each nozzle module 200. In an alternative embodiment, however, air for actuating the nozzle module 200 may be supplied to an outer side of the nozzle module 200, which eliminates the requirement for the air supply conduits 170 in the main manifold 100.

[0023] In the exemplary embodiment, the fluid metering device 300 includes eight fluid outlets 330 capable of independently supplying fluid to eight corresponding nozzles 20 through corresponding fluid supply conduits 30. The main manifold 100 of the exemplary embodiment may therefore be configured for dispensing fluid up to eight nozzles 20 at any one time by coupling nozzles 20 to corresponding fluid supply conduits 30 on either the first or second end portions 102 and 104 of the main manifold 100. A blocking member 500 is mountable over the unused fluid supply conduits 30, and in alternative embodiments the blocking member may block also the air supply conduits 170. The fluid in some blocked fluid supply conduits 30 is recirculated back toward the fluid reservoir, or tank, as further discussed below. Other embodiments may include additional fluid supply conduits 30 in the main manifold 100 and may employ a fluid metering device with more or less than eight fluid outlet ports.

[0024] FIG. 6 shows a plurality of nozzles 20 arrangeable along the first end portion 102 of the main manifold 100 wherein a spacing between adjacent nozzles 20 is substantially equal. The spacing between the nozzles 20 is based on a spacing between a central portion 230 of adjacent nozzles 20. In the exemplary embodiment, the fluid supply conduits 30 also have substantially equal spacing therebetween so that the spacing of the nozzle modules 200 is substantially equal. The spacing between the side portions 106 and 108 and the outermost fluid supply conduits 30 however is approximately one-half the spacing between adjacent fluid supply conduits 30 interior of the side portions 106 and 108. According to this configuration, the central portion 230 of the nozzles 20 coupled to the sidemost fluid supply conduits 30 is spaced similarly from the corresponding side portion 106 and 108 so that the central portions 230 of the sidemost nozzles 20 of adjacently mounted main manifolds 100 have the same spacing as the other nozzles.

[0025] FIG. 6 also shows the fluid supply conduits 30 on the second end portion 104 of the main manifold 100 offset relative to the fluid supply conduits 30 on the first end portion 102 of the main manifold 100. According to this configuration, nozzles 20 mounted on the second end portion 104 of the main manifold 100 are offset relative to nozzles 20 on the first end portion 102 of the main manifold 100. The offset spacing of the central portions 230 of the nozzles 20 disposed on opposing sides

102 and 104 of the main manifold 100 provides an interleaved fluid dispensing pattern. This offset arrangement of nozzles 20 on opposing ends of the main manifold 100 effectively forms an array of nozzles 20 with reduced spacing between the central portions 230 of adjacent nozzles compared to the nozzle spacing available by disposing nozzles on only one side of the main manifold 100. The reduced nozzle spacing is useful for some fluid dispensing applications.

[0026] An air preheater module 400 with a preheater interface 410 is mountable on the air interface 220 of a plurality of adjacently mounted nozzle modules 200, and may include a recessed portion 412 to reduce heat transfer from the air preheater module 400 to the nozzle modules 200. The air preheater module 400 includes a compressed air inlet port 420 for directing compressed air through an arrangement of parallel conduits 430 disposed over heating members 440, wherein the parallel conduits 430 have relatively increased surface area, which improves heat transfer to the air. The heated air is directed into a common plenum 450, and through a plurality of air supply conduits 460 each having an outlet port 462 coupleable to a corresponding air inlet port 222 of a corresponding nozzle module 200. An adjustable throttling valve 470 is disposed in each air supply conduit 460 for controlling heated air flow therethrough. The location of the air preheater 400 on the outer side of the nozzle module 200, apart from the main manifold 100, permits controlling the temperature of the compressed air independent from the temperature of the main manifold 100, which provides improved control of fluid dispensed from the nozzle 20.

[0027] FIGS. 5 and 6 further illustrate an alternative configuration wherein the system 10 includes a plurality of recirculation conduits 40 each interconnectable between a corresponding fluid supply conduit 30 and the fluid reservoir, or tank, by a plurality of one-way valves V each disposed along a corresponding recirculation conduit 40. The main manifold 100 includes a second interface 180 on which is mountable a recirculation manifold 600 having a recirculation interface 610. The second interface 180 of the main manifold 100 includes a plurality of recirculation outlet ports 182 for coupling the plurality of recirculation conduits 40 to a plurality of recirculation inlet ports 612 on the recirculation interface 610 of the recirculation manifold 600 as further discussed below.

[0028] In one embodiment, the plurality of one-way valves V are a plurality of one-way check valves 50 each disposed along a corresponding recirculation conduit 40 in the main manifold for recirculating fluid toward the recirculation manifold 600 when the fluid pressure in a corresponding fluid supply conduit 30 is at a first pressure threshold as discussed above. A check valve suitable for this application is Model No. 2206 available from Kepner Products, Villa Park, Illinois. In the exemplary embodiment of FIG. 7a, the recirculation manifold includes a fluid discharge port 620 coupled to the fluid reservoir, and a normally closed pressure relief valve 60 disposed in a corresponding recess in the recirculation manifold 600. The pressure relief valve 60 opens to recirculate fluid from .the recirculation conduits 40 to the discharge port 620 and toward the tank when the fluid pressure between the check valves 50 and the pressure relief valve 60 is at a second pressure threshold as discussed above. A pressure relief valve suitable for this application is Model No. CP 208-3 available from Compact Controls, Hillsboro, Oregon. In an alternative embodiment, the check valves 50 are disposed in the recirculation manifold 600. The recirculation manifold 600 also includes a pressure monitoring port 92 for receiving a pressure monitoring gauge 90, which monitors an average pressure between the check valves 50 and the pressure relief valve 60 as discussed above. The recirculation manifold 600 is interchangeably mountable on the main manifold 100 with recirculation manifolds having other configurations. A pressure transducer connectable to an indicator or alarm may alternatively be coupled to the pressure port 92 for indicating that fluid is being recirculated from one or more fluid supply conduits 30 as discussed above.

[0029] In the embodiment of FIG. 7b, a recirculation manifold 600 is configured similarly to the embodiment of FIG. 7a, and includes additionally a normally closed diverter valve 80 disposed in a corresponding recess in the recirculation manifold 600. The diverter valve 80 is disposed between the plurality of one-way check valves 50 and the tank in parallel to the normally closed pressure relief valve 60, and is coupled to the fluid discharge port 620 of the recirculation manifold 600 by a fluid outlet conduit 82. The diverter valve 80 facilitates relieving fluid pressure in the fluid supply conduits 30 when the pump is energized and when the plurality of nozzles 20 are closed to reduce the tendency for fluid to surge through the nozzles 20 when the nozzles are first opened as discussed above. In operation, the normally closed diverter valve 80 is opened when the nozzle modules 200 are closed, and the diverter valve is closed when the nozzle modules are opened. A diverter valve suitable for this application is Model No. CP 508-2 available from Compact Controls, Hillsboro, Oregon.

[0030] In another embodiment, the plurality of one-way valves V are individual pressure relief valves disposed in the main manifold 100, or disposed alternatively in a recirculation manifold 600. FIG. 8 shows an pressure relief valve 700 of the type disposable in the main manifold 100 having two matable body members 710 and 720 and a central bore 730 which houses a ball 740, or other similarly seatable member, biased toward a seat 750 by a coil spring 760 wherein the threshold pressure is determined by the spring constant. The pressure relief valves 700 may be used in combination with the recirculation manifold 600 of FIG. 7a by replacing the pressure relief valve 60 with a plug, which is not shown.

[0031] In the embodiment of FIG. 5, the main manifold 100 includes, alternatively, a plurality of pressure mon-

itoring ports 94 each coupled directly to a corresponding fluid supply conduit 30 for independently monitoring fluid pressure in the fluid supply conduit 30 with a corresponding pressure gauge 90. In the exemplary embodiments of FIGS. 5 and 6, the pressure monitoring ports 94 of the main manifold 100 are coupled to an array of corresponding ports 92 in the recirculation manifold 600 where corresponding pressure gauges 90 are coupled to the ports 92. The pressure gauges 90 may alternatively be disposed in the main manifold 100. The recirculation manifolds of FIGS. 7a and 7b may also alternatively be configured with individual pressure monitoring ports for coupling with the pressure monitoring ports 94 of the main manifold 100. Absent corresponding ports 92 in the recirculation manifold, the ports 94 in the main manifold 100 are blocked and are unused. A pressure transducer connectable to an indicator or alarm may alternatively be coupled to each pressure port 92 in the recirculation manifold, or directly with the ports 94 in the main manifold 100 in configurations where the ports 94 are not coupled with the recirculation manifold 100, for indicating that fluid is recirculating from a corresponding fluid supply conduit 30 as discussed above.

[0032] FIGS. 9a and 9b show a hot melt adhesive dispensing system of the type shown generally in FIG. 5 including a nozzle adapter plate 800 interconnecting the main manifold 100 and a plurality of nozzles 20. The nozzle adapter plate 800 includes a fluid interface 810 connectable to the first end 102 of the main manifold 100 and a nozzle interface 820 connectable to one or more nozzles 20. The nozzle adapter plate 800 includes a plurality of fluid supply conduits 830 interconnecting a corresponding fluid supply conduit 30 of the main manifold 100 and a corresponding nozzle 20 mountable on the nozzle adapter plate interface 820. In another configuration, the nozzle adapter plate 800 includes an air interface 850 with air supply ports for interconnecting the nozzles 20 and an air preheater module 400, which supplies compressed air for modifying fluid flow through the nozzles 20 as discussed above.

[0033] According to another aspect of the invention, the nozzle adapter plate 800 includes a recirculation conduit 840 for recirculating fluid from one or more fluid supply conduits 30 toward the reservoir. In one configuration, the recirculation conduit 840 is coupled to a recirculation conduit 42 in the main manifold 100 for recirculating fluid from the unused fluid supply conduit 830 to the fluid supply conduit 130 in the main manifold 100. Generally, each fluid supply conduit 830 is selectably connectable to the recirculation conduit 840 by a valve or removable plug for recirculating fluid in the event that a corresponding nozzle is closed or a nozzle is replaced by a blocking member 500 as discussed above. According to this configuration, fluid from any blocked fluid supply conduit 830 is recirculated through the recirculation conduit 840 toward the reservoir by opening the valve or removing the plug to couple the fluid supply conduit 830 to the recirculation conduit 840. According to another configuration, the recirculation conduit 840 is coupled only to one or more unused or blocked off fluid supply conduits 832 and 833, which is desired for some fluid dispensing applications.

[0034] While the foregoing written description of the invention enables anyone skilled in the art to make and use what is at present considered to be the best mode of the invention, it will be appreciated and understood by those skilled in the art the existence of variations, combinations, modifications and equivalents within the scope of the specific exemplary embodiments disclosed herein. The present invention therefore is to be limited not by the specific exemplary embodiments disclosed herein but by all embodiments within the scope of the appended claims.

Claims

1. A system (10) usable for dispensing fluids including hot melt adhesives, supplied from a reservoir, onto a substrate, the system comprising:

   a plurality of fluid dispensing nozzles (20);
   a fluid metering device (300) having a plurality of metered fluid outlets (330) for supplying fluid from the reservoir;
   a plurality of fluid supply conduits (30), each of which is interconnected between a metered fluid outlet (330) of the fluid metering device and a corresponding fluid dispensing nozzle (20);
   a plurality of fluid recirculation conduits (40), each of which is interconnected between a corresponding fluid supply conduit (30) and one of the reservoir and fluid metering device (300); and
   a plurality of one-way valves (50,60, V), each of which is disposed in a corresponding recirculation conduit, wherein each one-way valve independently recirculates fluid from its corresponding fluid supply conduit to one of the reservoir and fluid metering device when pressure in the corresponding fluid supply conduit exceeds a first threshold pressure.

2. A system according to claim 1, wherein the plurality of one-way valves is a plurality of pressure relief valves (60).

3. A system according to any one of claim 1, wherein the plurality of one-way valves is a plurality of check valves (50), and

   wherein at least one pressure relief valve (60) is disposed between the plurality of check valves (50) and the reservoir, and wherein the pressure relief valve recirculates fluid received from each of the plurality of check valves toward the reservoir when pressure between the check valves and the pres-

sure relief valve exceeds a second threshold pressure greater than the first threshold pressure.

4. A system according to any one of claims 1 to 3, further comprising a plurality of pressure monitoring ports (90), each pressure monitoring port connectable with a corresponding fluid supply conduit for independently monitoring pressure in the corresponding fluid supply conduit.

5. A system according to claim 3, further comprising a pressure port (90) for monitoring an average pressure in the recirculation conduits between the plurality of check valves and the pressure relief valve.

6. A system according to claim 3, 4 or 5, further comprising a diverter valve (80) disposed between the plurality of check valves (50) and one of the reservoir and fluid metering device, the diverter valve disposed parallel to the pressure relief valve (60),

wherein the plurality of fluid dispensing nozzles (20) are actuable between an opened and closed configuration, and wherein the diverter valve (80) is in the opened configuration when the plurality of fluid dispensing nozzles (20) are in the closed configuration, and the diverter valve is in the closed configuration when the plurality of fluid dispensing nozzles are in the opened configuration.

7. A system according to any one of the preceding, further comprising a plurality of air supply conduits (30), each of which is interconnected between an air supply and a corresponding fluid dispensing nozzle (20) for modifying the dispensing of fluid from the fluid dispensing nozzle.

8. A system according to any one of the preceding claims, further comprising:

a main manifold (100) having a first end portion (102) with a plurality of fluid outlet ports (32) each coupleable to a fluid dispensing nozzle (20), a second interface (180) with a plurality of recirculation outlet ports (192), a fluid supply conduit (30) disposed in the main manifold between the fluid metering device and a corresponding fluid outlet port, a fluid recirculation conduit (40) disposed in the main manifold between a corresponding fluid supply conduit and a corresponding recirculation outlet port and a one-way valve (50) disposed along a corresponding fluid recirculation conduit; and

a recirculation manifold (600) having a plurality of recirculation inlet ports (612) on a recirculation interface (610) mountable on the second interface of the main manifold, wherein each of the plurality of recirculation inlet ports of the recirculation manifold is coupled to a corresponding fluid recirculation conduit (40) of the main manifold.

9. The system of claim 8, further comprising a nozzle adapter plate (800) interconnecting the main manifold (100) and the plurality of fluid dispensing nozzles (20), the nozzle adapter plate (800) having a second recirculation conduit (840) interconnectable with one or more fluid supply conduits (30) of the main manifold and the reservoir for recirculating fluid from the one or more fluid supply conduits toward the reservoir.

10. The system of claim 8, further comprising a plurality of nozzle modules (200), each nozzle module corresponding to one of the plurality of fluid dispensing nozzles (20), and each nozzle module having a fluid inlet port (232) on a fluid interface (210) mountable with the first end portion of the main manifold, wherein the fluid inlet port of the nozzle module is coupled to a corresponding fluid outlet port of the main manifold.

11. A system according to any one of claims 8 to 10, wherein the recirculation manifold includes a plurality of pressure monitoring ports (90), each pressure monitoring port connectable with a corresponding fluid supply conduit for independently monitoring pressure in the corresponding fluid supply conduit.

12. A system according to any one of claims 8 to 11, wherein the plurality of one-way valves is a plurality of check valves (50), and each check valve independently recirculates fluid from the corresponding fluid supply conduit toward the reservoir when pressure in the corresponding fluid supply conduit exceeds a first threshold pressure; and

wherein at least one pressure relief valve (60), disposed in the recirculation manifold between the plurality of check valves and the reservoir, recirculates fluid from the plurality of check valves toward the reservoir when pressure between the plurality of check valves and the pressure relief valve exceeds a second threshold pressure greater than the first threshold pressure.

13. The system of claim 12, further comprising a pressure port (90) in the recirculation manifold for monitoring an average pressure in the recirculation conduits between the plurality of check valves (50) and the pressure relief valve (60).

14. A system according to any one of claims 8 to 13 when dependent on claim 6, wherein the diverter valve (80) is disposed in the recirculation manifold (600).

15. A system according to any of claims 8 to 14, further

comprising an air preheater module (400) having a plurality of air outlet ports (462) on a preheater interface (410),

wherein the plurality of fluid dispensing nozzles (20) each have an air inlet port (222) connectable with a corresponding air outlet port (462) of the air preheater module for modifying the dispensing of fluid from the corresponding fluid dispensing nozzle.

16. A system according to any one of claims 8 to 15, wherein the main manifold (100) includes a second end portion (104) with a plurality of fluid outlet ports (32) each coupleable to a fluid dispensing nozzle (20), and a fluid supply conduit (30) disposed in the main manifold between the fluid metering device and a corresponding fluid outlet port on the second end portion, the second end portion on an opposing end of the main manifold as the first end portion, wherein fluid dispensing nozzles coupled to the second end portion of the main manifold are offset relative to fluid dispensing nozzles coupled to the first end portion of the main manifold.

17. A system according to claim 1, further comprising;

a main manifold (100) having the plurality of fluid supply conduits (30), each of which is coupled between the fluid metering device (300) and a corresponding fluid dispensing nozzle (20), the main manifold (100) having a fluid recirculation conduit disposed between each fluid supply conduit and a corresponding recirculation outlet port disposed on a recirculation module interface; and

a recirculation module (600) for recirculating fluid from the main manifold to the reservoir, the recirculation module having a plurality of fluid inlet ports (612) disposed on a mounting surface of the recirculation module, interchangeably mountable on the recirculation module interface of the main manifold, wherein fluid inlet ports of the recirculation module are coupleable with corresponding recirculation outlet ports (182) of the main manifold.

18. A system according to claim 17, wherein the main manifold includes a plurality of pressure monitoring ports (92) in the recirculation module interface for independently monitoring pressure in the corresponding fluid supply conduit, the recirculation module including a plurality of pressure monitoring ports coupled with a corresponding pressure monitoring port (94) of the main manifold when the recirculation module is interchangeably mounted on the recirculation module interface of the main manifold.

Patentansprüche

1. System (10), das verwendbar ist zum Auftragen von Fluiden, einschließlich heißen Schmelzklebstoffen, die aus einem Vorratsbehälter zugeleitet werden, auf ein Substrat,
wobei das System umfasst:

eine Vielzahl von Fluidauftragsdüsen (20);
eine Fluiddosiervorrichtung (300), die eine Vielzahl von dosierten Fluidauslässen (330) zur Zuleitung von Fluid aus dem Vorratsbehälter aufweist;
eine Vielzahl von Fluidzulaufleitungen (30), die jede mit einem dosierten Fluidauslass (330) der Fluiddosiervorrichtung und einer entsprechenden Fluidauftragsdüse (20) verbunden sind;
eine Vielzahl von Fluidrückführleitungen (40), die jede mit einer entsprechenden Fluidzulaufleitung (30) und mit dem Vorratsbehälter oder mit der Fluiddosiervorrichtung (300) verbunden sind; und
eine Vielzahl von Einwegventilen (50, 60, V), die jedes in einer entsprechenden Rückführleitung angeordnet sind, wobei jedes Einwegventil unabhängig Fluid aus seiner entsprechenden Fluidzulaufleitung in den Vorratsbehälter oder in die Fluiddosiervorrichtung zurückleitet, wenn der Druck in der entsprechenden Fluidzulaufleitung einen ersten Schwellendruck übersteigt.

2. System nach Anspruch 1, wobei die Vielzahl von Einwegventilen eine Vielzahl von Druckminderventilen (60) ist.

3. System nach Anspruch 1, wobei die Vielzahl von Einwegventilen eine Vielzahl von Prüfventilen (50) ist, und wobei mindestens ein Druckminderventil (60) zwischen der Vielzahl von Prüfventilen (50) und dem Vorratsbehälter angeordnet ist, und wobei das Druckminderventil Fluid, das von jedem der Prüfventile empfangen wurde, zum Vorratsbehälter zurückleitet, wenn der Druck zwischen den Prüfventilen und dem Druckminderventil einen zweiten Schwellendruck übersteigt, der über dem ersten Schwellendruck liegt.

4. System nach einem der Ansprüche 1 bis 3, das ferner eine Vielzahl von Drucküberwachungsöffnungen (90) umfasst, wobei jede Drucküberwachungsöffnung mit einer entsprechenden Fluidzulaufleitung zum unabhängigen Überwachen des Drucks in der entsprechenden Fluidzulaufleitung verbindbar ist.

5. System nach Anspruch 3, das ferner eine Drucköffnung (90) zum Überwachen eines Durchschnitts-

drucks in den Rückführleitungen zwischen der Vielzahl von Prüfventilen und dem Druckminderventil umfasst.

6. System nach Anspruch 3, 4 oder 5, das ferner ein Umleitventil (80) umfasst, welches zwischen der Vielzahl von Prüfventilen und dem Vorratsbehälter oder der Fluiddosiervorrichtung und parallel zum Druckminderventil (60) angeordnet ist, wobei die Vielzahl von Fluidauftragsdüsen (20) zwischen einer geöffneten Stellung und einer geschlossenen Stellung betreibbar ist, und wobei das Umleitventil (80) in der geöffneten Stellung ist, wenn sich die Vielzahl von Fluidauftragsdüsen in der geschlossenen Stellung befindet, und das Umleitventil in der geschlossenen Stellung ist, wenn sich die Vielzahl von Fluidauftragsdüsen in der geöffneten Stellung befindet.

7. System nach einem der vorhergehenden Ansprüche, das ferner eine Vielzahl von Luftzufuhrleitungen (30) umfasst, die jede mit einer Luftzufuhr und einer entsprechenden Fluidauftragsdüse (20) zum Modifizieren des Fluidauftrags aus der Fluidauftragsdüse verbunden sind.

8. System nach einem der vorhergehenden Ansprüche, das ferner umfasst:

einen Hauptverteiler (100), der einen ersten Endabschnitt (102) mit einer Vielzahl von Fluidauslassöffnungen (32) aufweist, die jede mit einer Fluidauftragsdüse (20) verbindbar sind, eine zweite Schnittstelle (180) mit einer Vielzahl von Rückführauslassöffnungen (192), eine Fluidzulaufleitung (30), die im Hauptverteiler zwischen der Fluiddosiervorrichtung und einer entsprechenden Fluidauslassöffnung angeordnet ist, eine Fluidrückführleitung (40), die im Hauptverteiler zwischen einer entsprechenden Fluidzulaufleitung und einer entsprechenden Fluidauslassöffnung angeordnet ist, und ein Einwegventil, das in einer entsprechenden Fluidrückführleitung angeordnet ist; und

einen Rückführverteiler (600), der eine Vielzahl von Rückführeinlassöffnungen (612) an einer Rückführschnittstelle (610) aufweist, welche an der zweiten Schnittstelle des Hauptverteilers anbringbar ist, wobei jede der Vielzahl von Rückführeinlassöffnungen des Rückführverteilers an eine entsprechende Fluidrückführleitung (40) des Hauptverteilers angeschlossen ist.

9. System nach Anspruch 8, das ferner eine Düsenadapterplatte (800) umfasst, die den Hauptverteiler (100) und die Vielzahl von Fluidauftragsdüsen (20) miteinander verbindet, wobei die Adapterplatte (800) eine zweite Rückführleitung (840) aufweist, welche mit einer oder mehreren Fluidzulaufleitungen (30) des Hauptverteilers und dem Vorratsbehälter zum Zurückleiten von Fluid aus einer oder mehreren Fluidzulaufleitungen zum Vorratsbehälter verbindbar ist.

10. System nach Anspruch 8, das ferner eine Vielzahl von Düsenmodulen (200) umfasst, wobei jedes Düsenmodul einer der Vielzahl von Fluidauftragsdüsen (20) entspricht, und jedes Düsenmodul eine Fluideinlassöffnung (232) an einer Fluidschnittstelle (210) aufweist, die am ersten Endabschnitt des Hauptverteilers anbringbar ist, wobei die Fluideinlassöffnung des Düsenmoduls an eine entsprechende Fluidauslassöffnung des Hauptverteilers angeschlossen ist.

11. System nach einem der Ansprüche 8 bis 10, wobei der Rückführverteiler eine Vielzahl von Drucküberwachungsöffnungen (90) beinhaltet, und jede Drucküberwachungsöffnung mit einer entsprechenden Fluidzulaufleitung zum unabhängigen Überwachen des Drucks in der entsprechenden Fluidzulaufleitung verbindbar ist.

12. System nach einem der Ansprüche 8 bis 11, wobei die Vielzahl von Einwegventilen eine Vielzahl von Prüfventilen (50) ist, und jedes Prüfventil unabhängig Fluid aus der entsprechenden Fluidzulaufleitung zum Vorratsbehälter zurückleitet, wenn der Druck in der entsprechenden Fluidzulaufleitung einen ersten Schwellendruck übersteigt; und

wobei mindestens ein Druckminderventil (60), welches im Rückführverteiler zwischen der Vielzahl von Prüfventilen und dem Vorratsbehälter angeordnet ist, Fluid aus der Vielzahl von Prüfventilen zum Vorratsbehälter zurückleitet, wenn der Druck zwischen der Vielzahl von Prüfventilen und dem Druckminderventil einen zweiten Schwellendruck übersteigt, der über dem ersten Schwellendruck liegt.

13. System nach Anspruch 12, das ferner eine Drucköffnung (90) im Rückführverteiler zum Überwachen eines Durchschnittsdrucks in den Rückführleitungen zwischen der Vielzahl von Prüfventilen (50) und dem Druckminderventil (60) umfasst.

14. System nach einem der Ansprüche 8 bis 13, sofern abhängig von Anspruch 6, wobei das Umleitventil (80) im Rückführverteiler (600) angeordnet ist.

15. System nach einem der Ansprüche 8 bis 14, das ferner ein Luftvorwärmmodul (400) umfasst, welches eine Vielzahl von Luftaustrittsöffnungen (462) an einer Vorwärmschnittstelle (410) aufweist,

wobei jede der Vielzahl von Fluidauftragsdü-

sen (20) eine Lufteintrittsöffnung (22) aufweist, die mit einer entsprechenden Luftaustrittsöffnung (462) des Luftvorwärmmoduls zum Modifizieren der Fluidverteilung aus der Fluidauftragsdüse verbindbar ist.

16. System nach einem der Ansprüche 8 bis 15, wobei der Hauptverteiler (100) einen zweiten Endabschnitt (104) mit einer Vielzahl von Fluidauslassöffnungen (32), die jede mit einer Fluidauftragsdüse (20) verbindbar sind, und eine Fluidzulaufleitung (30) beinhaltet, die im Hauptverteiler zwischen der Fluiddosiervorrichtung und einer entsprechenden Fluidauslassöffnung am zweiten Endabschnitt angeordnet ist, welcher an einem dem ersten Endabschnitt entgegengesetzten Ende des Hauptverteilers liegt, wobei die Fluidauftragsdüsen, die an den zweiten Endabschnitt des Hauptverteilers angeschlossen sind, im Verhältnis zu den Fluidauftragsdüsen, die an den ersten Endabschnitt des Hauptverteilers angeschlossen sind, versetzt sind.

17. System nach Anspruch 1, das ferner umfasst:

einen Hauptverteiler (100), der eine Vielzahl von Fluidzulaufleitungen (30) aufweist, von denen jede zwischen der Fluiddosiervorrichtung (300) und einer entsprechenden Fluidauftragsdüse (20) angeschlossen ist, wobei der Hauptverteiler (100) eine Fluidrückführleitung, die zwischen jeder Fluidzulaufleitung angeordnet ist, und eine entsprechende Fluidauslassöffnung aufweist, die an einer Rückführmodulschnittstelle angeordnet ist; und
ein Rückführmodul (600) zum Zurückleiten von Fluid aus dem Hauptverteiler zum Vorratsbehälter, wobei das Rückführmodul eine Vielzahl von Fluideinlassöffnungen (612) aufweist, die an einer Montagefläche des Rückführungsmoduls angeordnet sind, welches austauschbar an der Rückführmodulschnittstelle des Hauptverteilers befestigbar ist, wobei Fluideinlassöffnungen des Rückführmoduls mit entsprechenden Rückführauslassöffnungen (182) des Hauptverteilers verbindbar sind.

18. System nach Anspruch 17, wobei der Hauptverteiler eine Vielzahl von Drucküberwachungsöffnungen (92) in der Rückführmodulschnittstelle zum unabhängigen Überwachen des Drucks in der entsprechenden Fluidzulaufleitung beinhaltet, und das Rückführmodul eine Vielzahl von Drucküberwachungsöffnungen beinhaltet, die mit einer entsprechenden Drucküberwachungsöffnung (94) des Hauptverteilers verbunden sind, wobei das Rückführmodul austauschbar an der Rückführschnittstelle des Hauptverteilers befestigt ist.

Revendications

1. Système (10) pouvant être utilisé pour distribuer des fluides, incluant des colles thermofusibles, délivrés à partir d'un réservoir, sur un substrat, le système comprenant :

une pluralité de buses (20) de distribution de fluide ;
un dispositif de mesure de fluide (300) comportant une pluralité de sorties de fluide mesuré (330) pour délivrance de fluide à partir du réservoir ;
une pluralité de conduits (30) de délivrance de fluide, dont chacun est raccordé entre une sortie (330) de fluide mesuré du dispositif de mesure de fluide et une buse (20) de distribution de fluide correspondante ;
une pluralité de conduits (40) de recirculation de fluide, dont chacun est raccordé entre un conduit (30) de délivrance de fluide correspondant et l'un, du réservoir ou du dispositif (300) de mesure de fluide ; et
une pluralité de vannes unidirectionnelles (50, 60, V), dont chacune est disposée dans un conduit de recirculation correspondant, dans lequel chaque vanne unidirectionnelle remet en circulation indépendamment un fluide provenant de son conduit de délivrance de fluide correspondant vers l'un, du réservoir ou du dispositif de mesure de fluide lorsqu'une pression dans le conduit de délivrance de fluide correspondant dépasse une première pression de seuil.

2. Système selon la revendication 1, dans lequel la pluralité de vannes unidirectionnelles est une pluralité de vannes (60) de décharge.

3. Système selon l'une quelconque de la revendication 1 ou 2, dans lequel la pluralité de vannes unidirectionnelles est une pluralité de vannes (50) de non-retour, et
dans lequel au moins une vanne (60) de décharge est disposée entre la pluralité de vannes (50) de non-retour et le réservoir, et dans lequel la vanne de décharge remet en circulation un fluide reçu de chacune de la pluralité de vannes de non-retour vers le réservoir lorsqu'une pression entre les vannes de non-retour et la vanne de décharge dépasse une seconde pression de seuil plus élevée que la première pression de seuil.

4. Système selon l'une quelconque des revendications 1 à 3, comprenant en outre une pluralité d'orifices (90) de surveillance de pression, chaque orifice de surveillance de pression pouvant être raccordé à un conduit de délivrance de fluide corres-

pondant pour une surveillance indépendante de pression dans le conduit de délivrance de fluide correspondant.

5. Système selon la revendication 3, comprenant en outre un orifice (90) de pression destiné à surveiller une pression moyenne dans les conduits de recirculation entre la pluralité de vannes de non-retour et la vanne de décharge.

6. Système selon la revendication 3, 4 ou 5, comprenant en outre une vanne (80) de dérivation disposée entre la pluralité de vannes (50) de non-retour et l'un du réservoir ou du dispositif de mesure de fluide, la vanne de dérivation étant disposée parallèlement à la vanne (60) de décharge,

dans lequel la pluralité de buses (20) de distribution de fluide peut être actionnée entre une configuration ouverte et fermée, et dans lequel la vanne (80) de dérivation est en configuration ouverte lorsque la pluralité de buses (20) de distribution de fluide est en configuration fermée, et dans lequel la vanne de dérivation est en configuration fermée lorsque la pluralité de buses de distribution de fluide est en configuration ouverte.

7. Système selon l'une quelconque des revendications précédentes, comprenant en outre une pluralité de conduits (30) d'alimentation en air, dont chacun est raccordé entre une alimentation en air et une buse (20) de distribution de fluide correspondante dans le but de modifier la distribution de fluide à partir de la buse de distribution de fluide.

8. Système selon l'une quelconque des revendications précédentes, comprenant en outre :

un collecteur principal (100) comportant une première partie d'extrémité (102) munie d'une pluralité d'orifices (32) de sortie de fluide pouvant être accouplés chacun avec une buse (20) de distribution de fluide, une seconde interface (180) pourvue d'une pluralité d'orifices (192) de sortie de recirculation, un conduit (30) de délivrance de fluide disposé dans le collecteur principal entre le dispositif de mesure de fluide et un orifice de sortie de fluide correspondant, un conduit (40) de recirculation de fluide disposé dans le collecteur principal entre un conduit de délivrance de fluide correspondant et un orifice de sortie de recirculation correspondant et une vanne unidirectionnelle (50) disposée le long d'un conduit de recirculation de fluide correspondant ; et

un collecteur (600) de recirculation comportant une pluralité d'orifices (612) d'entrée de recirculation situés sur une interface (610) de recirculation pouvant être montée sur la seconde interface du collecteur principal,

dans lequel chacun de la pluralité d'orifices d'entrée de recirculation du collecteur de recirculation est associé à un conduit (40) de recirculation de fluide correspondant du collecteur principal.

9. Système selon la revendication 8, comprenant en outre une plaque (800) formant un adaptateur de buses raccordant le collecteur principal (100) et la pluralité de buses (20) de distribution de fluide, la plaque (800) formant un adaptateur de buses comportant un second conduit (840) de recirculation pouvant être raccordé avec un ou plusieurs conduits (30) de délivrance de fluide du collecteur principal et le réservoir, dans le but de remettre en circulation un fluide provenant d'un ou de plusieurs conduits de délivrance de fluide vers le réservoir.

10. Système selon la revendication 8, comprenant en outre une pluralité de modules (200) de buses, chaque module de buse correspondant à l'une de la pluralité de buses (20) de distribution de fluide, et chaque module de buse comportant un orifice (232) d'entrée de fluide situé sur une interface (210) de fluide pouvant être montée avec la première partie d'extrémité du collecteur principal,
dans lequel l'orifice d'entrée de fluide du module de buse est associé à un orifice de sortie de fluide correspondant du collecteur principal.

11. Système selon l'une quelconque des revendications 8 à 10, dans lequel le collecteur de recirculation comprend une pluralité d'orifices (90) de surveillance de pression, chaque orifice de surveillance de pression pouvant être raccordé au conduit de délivrance de fluide correspondant pour une surveillance indépendante de pression dans le conduit de délivrance de fluide correspondant.

12. Système selon l'une quelconque des revendications 8 à 11, dans lequel la pluralité de vannes unidirectionnelles est une pluralité de vannes (50) de non-retour, et chaque vanne de non-retour remet en circulation indépendamment un fluide provenant du conduit de délivrance de fluide correspondant vers le réservoir lorsque que la pression dans le conduit de délivrance de fluide correspondant dépasse une première pression de seuil ; et

dans lequel au moins une vanne (60) de décharge, disposée dans le collecteur de recirculation entre la pluralité de vannes de non-retour et le réservoir, remet en circulation un fluide provenant de la pluralité de vannes de non-retour vers le réservoir lorsqu'une pression entre la pluralité de vannes de non-retour et la pression de la vanne de décharge dépasse une seconde pression de seuil plus élevée que la première pression de seuil.

13. Système selon la revendication 12, comprenant en outre un orifice (90) de pression situé dans le collecteur de recirculation, destiné à surveiller une pression moyenne dans les conduits de recirculation entre la pluralité de vannes (50) de non-retour et la vanne (60) de décharge.

14. Système selon l'une quelconque des revendications 8 à 13 lorsqu'elle dépend de la revendication 6, dans lequel la vanne (80) de dérivation est disposée dans le collecteur (600) de recirculation.

15. Système selon l'une quelconque des revendications 8 à 14, comprenant en outre un module (400) de préchauffage d'air comportant une pluralité d'orifices (462) de sortie situés sur une interface (410) de préchauffage,

dans lequel les plusieurs buses (20) de distribution de fluide comportent chacune un orifice (222) d'entrée d'air pouvant être raccordé à l'orifice (462) de sortie d'air correspondant du module de préchauffage d'air dans le but de modifier la distribution de fluide à partir de la buse de distribution de fluide correspondante.

16. Système selon l'une quelconque des revendications 8 à 15, dans lequel le collecteur principal (100) comprend une seconde partie d'extrémité (104) pourvue d'une pluralité d'orifices (32) de sortie de fluide pouvant être accouplés chacun avec une buse (20) de distribution de fluide, et un conduit (30) de délivrance de fluide disposé dans le collecteur principal entre le dispositif de mesure de fluide et un orifice de sortie de fluide correspondant situé sur la seconde partie d'extrémité, la seconde partie d'extrémité étant située à l'extrémité opposée du collecteur principal comme la première partie d'extrémité,
dans laquelle des buses de distribution de fluide, associées à la seconde partie d'extrémité du collecteur principal, sont décalées par rapport aux buses de distribution de fluide associées à la première partie d'extrémité du collecteur principal.

17. Système selon la revendication 1, comprenant en outre ;

un collecteur principal (100) comportant la pluralité de conduits (30) de délivrance de fluide, dont chacun est raccordé entre le dispositif (300) de mesure de fluide et une buse (20) de distribution de fluide correspondante, le collecteur principal (100) comportant un conduit de recirculation de fluide disposé entre chaque conduit de délivrance de fluide et un orifice de sortie de recirculation correspondant disposé sur une interface de module de recirculation ; et
un module (600) de recirculation destiné à remettre en circulation un fluide provenant du collecteur principal vers le réservoir, le module de recirculation comportant plusieurs orifices (612) d'entrée de fluide disposés sur une surface de montage du module de recirculation, pouvant être monté de manière interchangeable sur l'interface de module de recirculation du collecteur principal, dans lequel des orifices d'entrée de fluide du module de recirculation peuvent être associés à des orifices (182) de sortie de recirculation du collecteur principal.

18. Système selon la revendication 17, dans lequel le collecteur principal comprend une pluralité d'orifices (92) de surveillance de pression dans l'interface de module de recirculation, servant à surveiller indépendamment une pression dans le conduit de délivrance de fluide correspondant, le module de recirculation incluant une pluralité d'orifices de surveillance de pression associés à un orifice (94) de surveillance de pression correspondant du collecteur principal lorsque le module de recirculation est monté de manière interchangeable sur l'interface de module de recirculation du collecteur principal.

FIG. 1

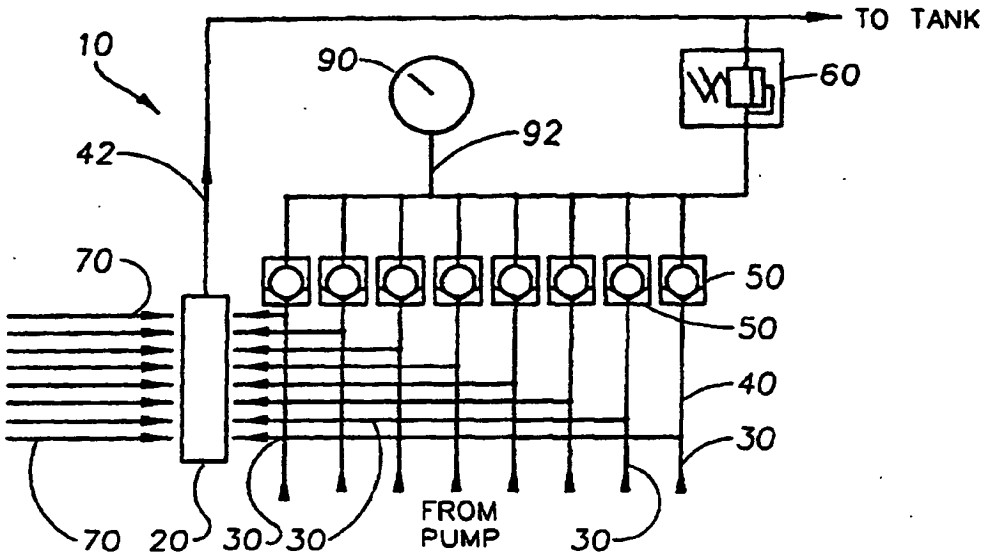

TO TANK
10
90
60
92
42
70
50
50
40
30
70
20
30
30
FROM PUMP
30

FIG. 2

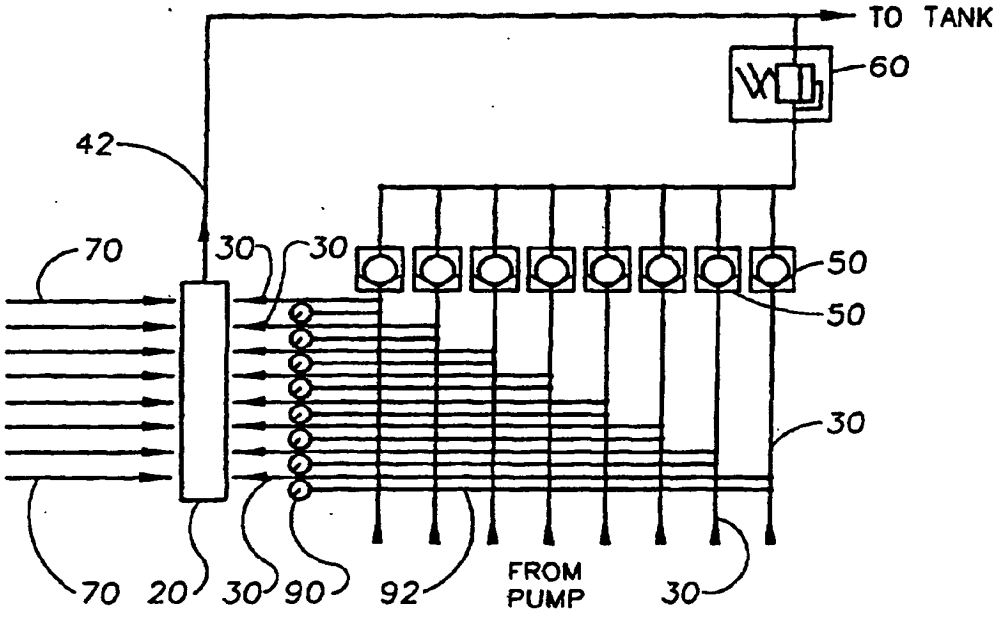

TO TANK
60
42
70
30
30
50
50
30
70
20
30
90
92
FROM PUMP
30

FIG. 3

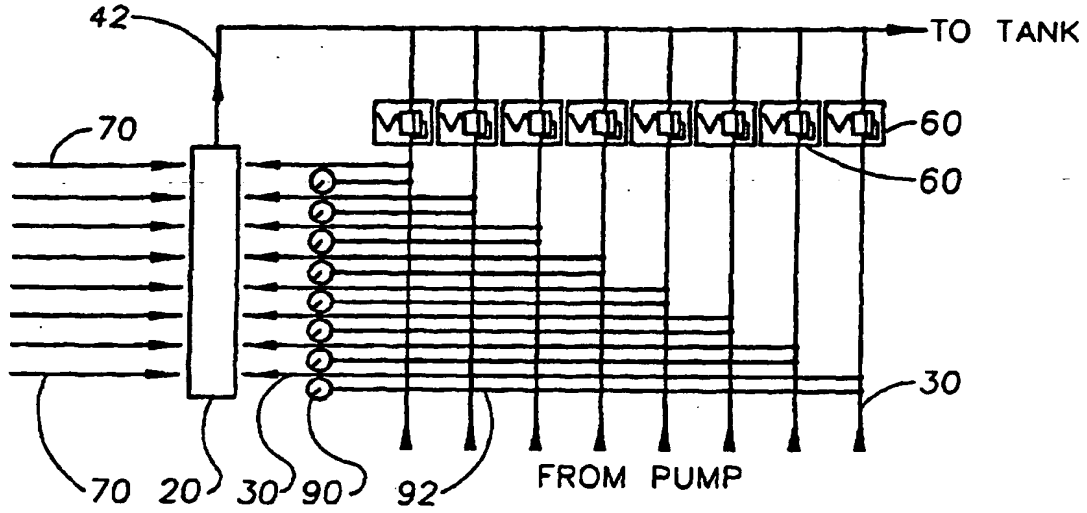

42
TO TANK
70
60
60
30
70
20
30
90
92
FROM PUMP

FIG. 4

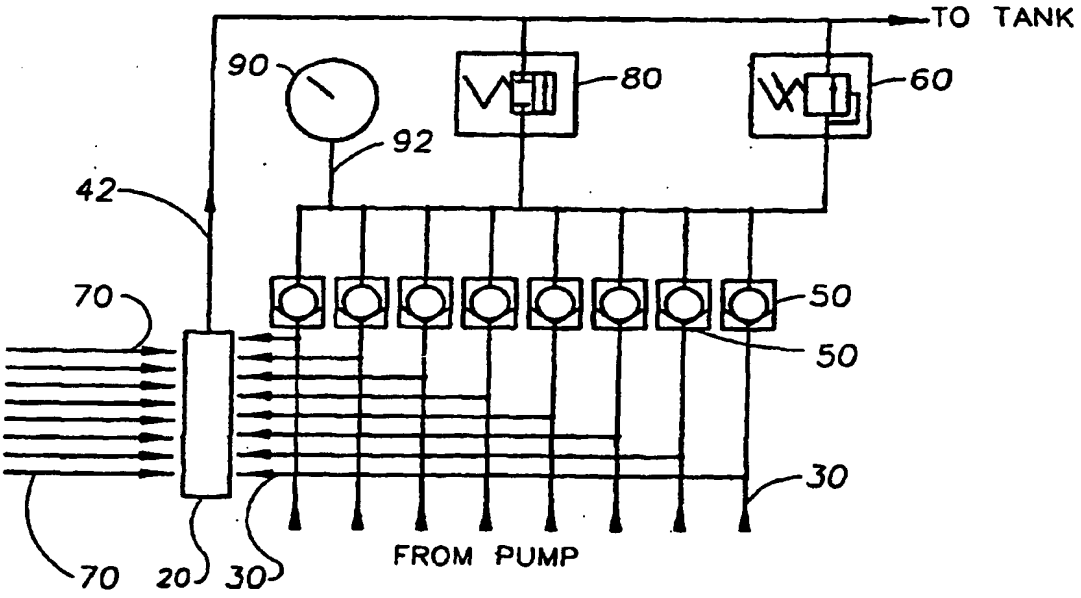
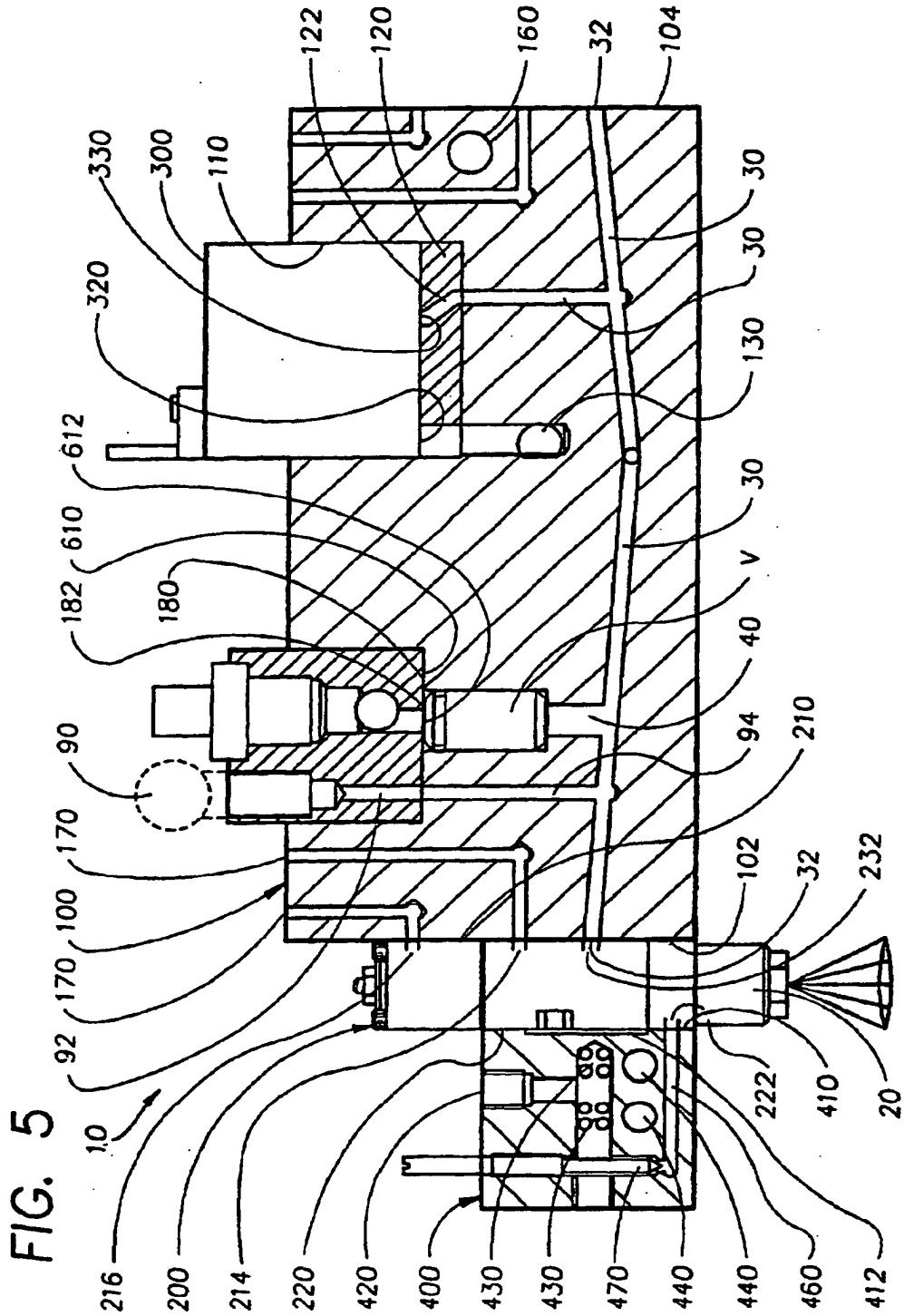

TO TANK
90
80
60
92
42
70
50
50
30
70
20
30
FROM PUMP

FIG. 5


10
20
30
32
40
90
92
94
100
102
104
110
120
122
130
160
170
180
182
200
210
214
216
220
222
232
300
320
330
400
410
412
420
430
440
460
470
610
612
V

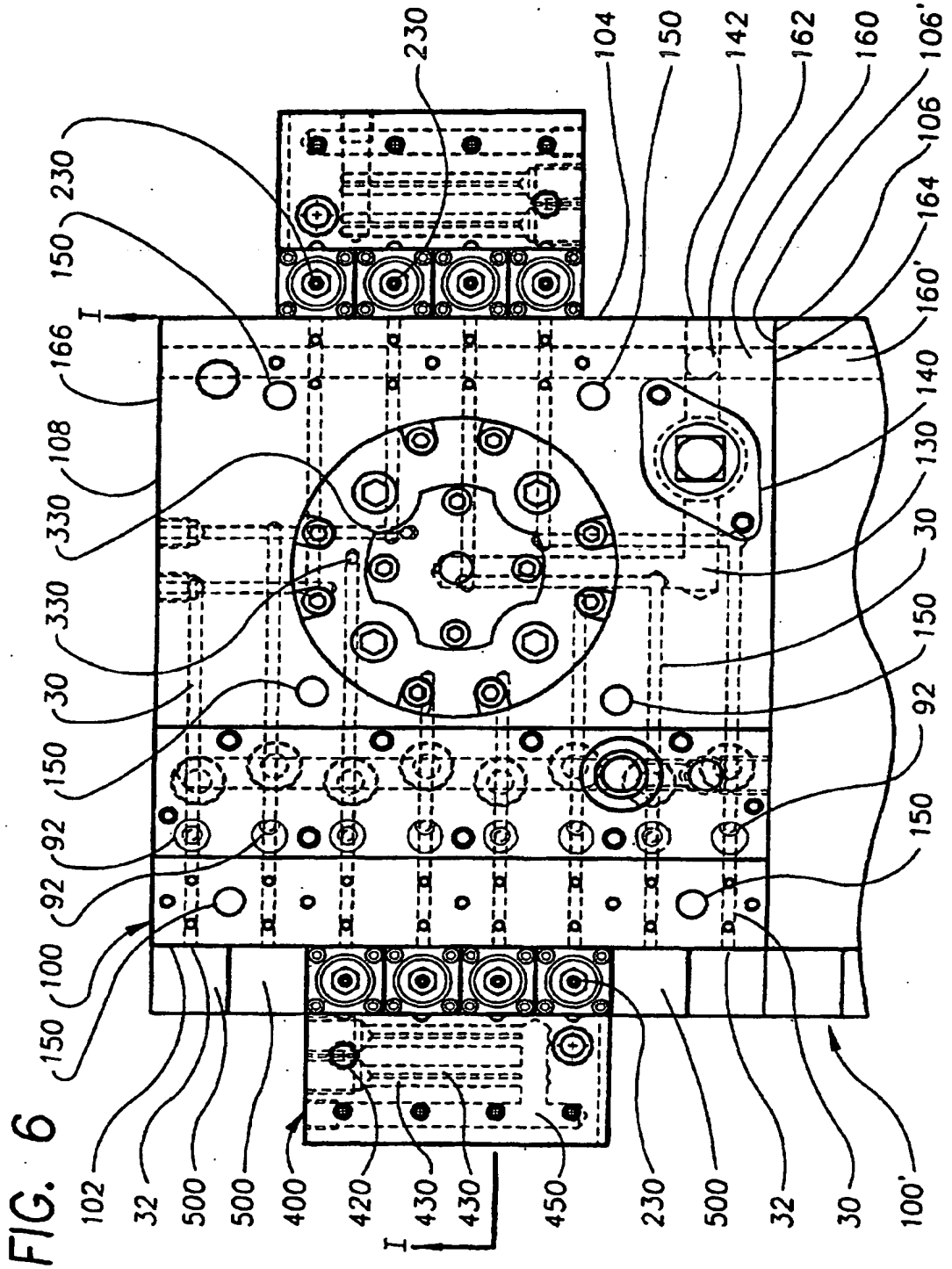

230
104
150
142
162
160
106'
106
164
160'
140
130
30
150
92
150
230
150
166
108
330
330
30
150
92
92
100
150
102
32
500
500
400
420
430
430
450
230
500
32
30
100'
I
I

FIG. 6

FIG. 7a

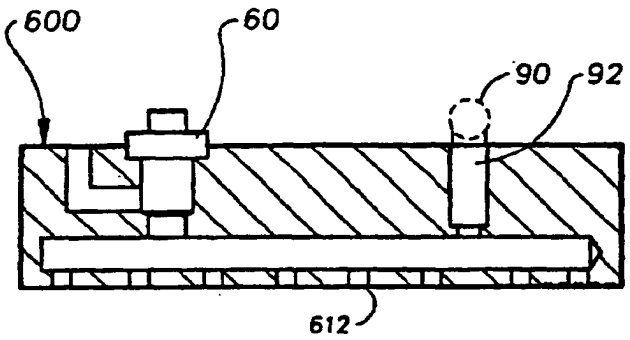


FIG. 7b

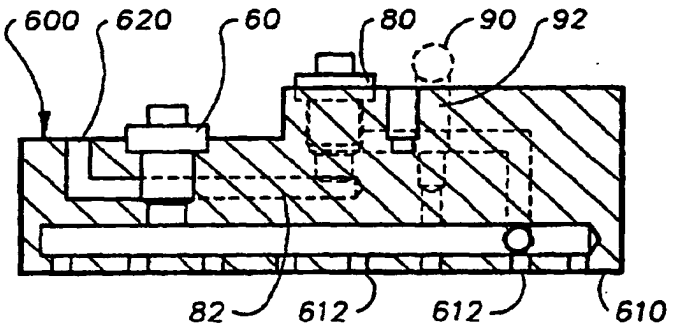
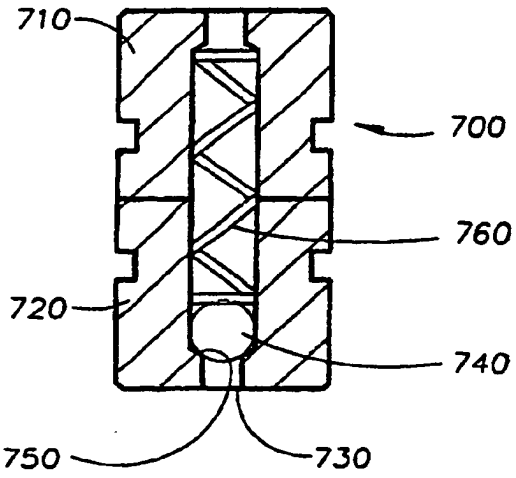


FIG. 8



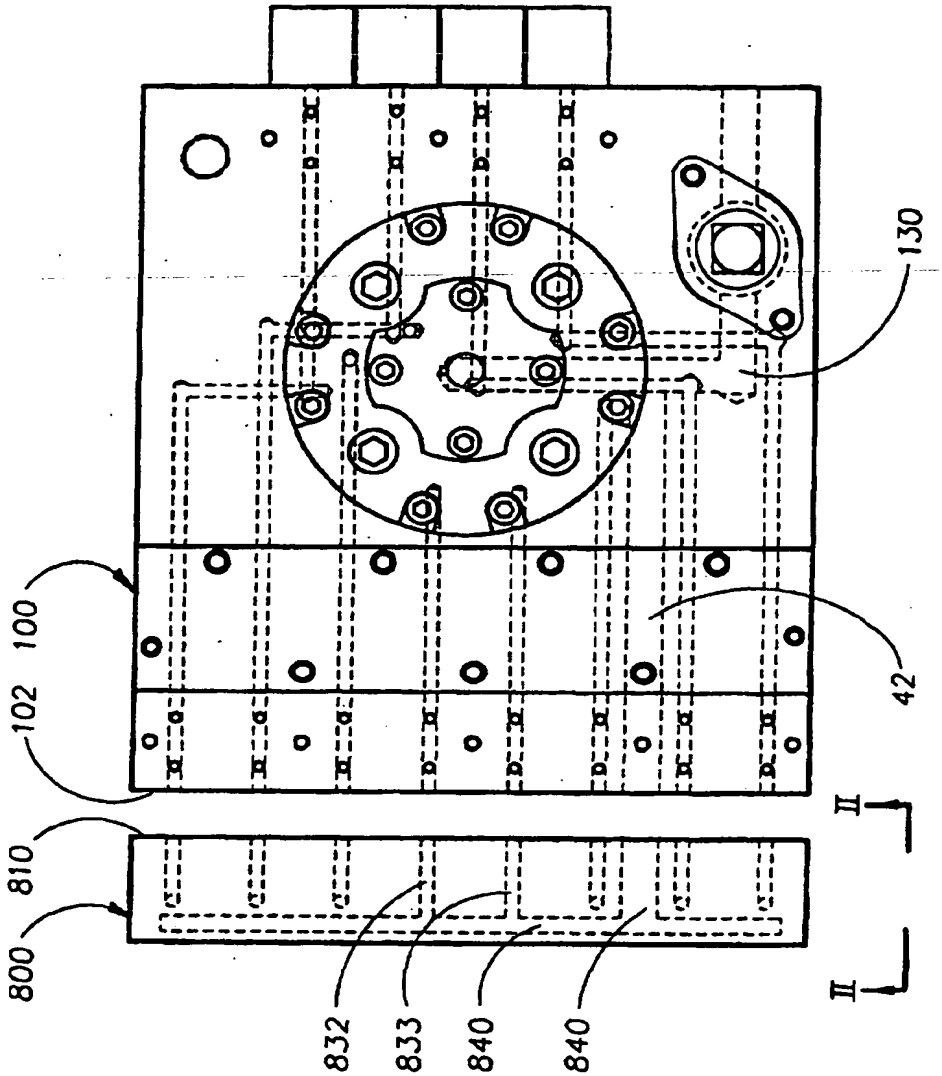

130
100
102
42
810
800
832
833
840
840
II
II

FIG. 9a

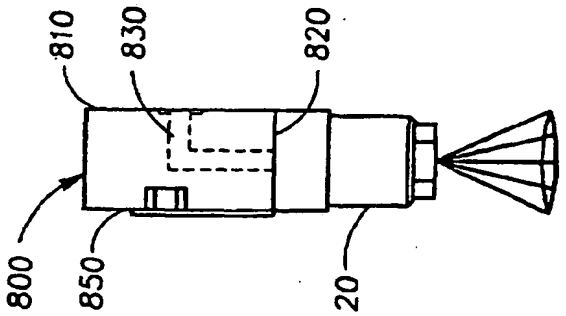

810
830
820
800
850
20

FIG. 9b

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